

6.1

Solving Equations by Using
Inverse Operations

LESSON 1

Connect

What is an equation?

An equation is an expression with an "equal" sign and another expression.

Examples:

$$\begin{array}{c} \text{L} \quad \downarrow \quad \text{R} \\ \underline{x + 5} = \underline{4} \end{array}$$

$$\begin{array}{c} \text{L} \quad \downarrow \quad \text{R} \\ \underline{2x - 6} = \underline{13} \end{array}$$

There is a Left side, an equal sign, and a right side.

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Linear Equations:

straight line.

A Linear equation is a polynomial of degree 1.

Examples:

$$x^1 + 5 = 4$$

$$2x^1 - 6 = 13$$

Quadratic Equations:

A Quadratic equation is a polynomial of degree 2.

Examples:

$$x^2 - 3x - 10 = 5$$

$$x^2 - 25 = 0$$

Connect

SOLVING EQUATIONS:

In order to solve for the unknown variable, you must isolate the variable using the **zero effect** (**Inverse operations**)

ZERO EFFECT: For every positive cancels out every negative to equal zero.

Examples:

$$\begin{array}{c} \downarrow \\ -4 + (+4) = 0 \end{array}$$

$$17 + (-17) = 0$$

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SOLVING EQUATIONS:

The goal to solve an equation is to get the unknown variable by itself. That is to isolate the variable.

To do this, you must think of an equation like a balance scale.

You must keep the equation balanced at all times.



Therefore, whatever mathematical operation you perform to the left side, you must perform the same operation to the right side.

$$\begin{array}{ccc} L & = & R \\ +5 & & +5 \\ -6 & & -6 \\ \times 3 & & \times 3 \\ \div 2 & & \div 2 \end{array}$$

Connect

SOLVING EQUATIONS:

EXAMPLE:

$$x - 4 = 10$$

$$x - 4 + 4 = 10 + 4$$

$$x = 14$$

Check:

$$\begin{array}{l} x - 4 = 10 \\ (14) - 4 = 10 \\ 10 = 10 \checkmark \end{array}$$

Things to Remember

Did you isolate the variable?

Did you have to divide by the number in front of the variable?

Did you need to get rid of the fraction?

Did you need to expand?

Did you have to collect like terms first?

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SOLVING EQUATIONS:

EXAMPLE:

$$x - 3 = 4$$

$$x - 3 + 3 = 4 + 3$$

$$x = 7$$

Check:

$$\begin{array}{l} x - 3 = 4 \\ (7) - 3 = 4 \\ 4 = 4 \checkmark \end{array}$$

Things to Remember

Did you isolate the variable?

Did you have to divide by the number in front of the variable?

Did you need to get rid of the fraction?

Did you need to expand?

Did you have to collect like terms first?

EXAMPLE:

$$x + 5 = 8$$

$$x + 5 - 5 = 8 - 5$$

$$x = 3$$

Check:

$$\begin{array}{l} x + 5 = 8 \\ (3) + 5 = 8 \\ 8 = 8 \checkmark \end{array}$$

Connect

SOLVING EQUATIONS:

EXAMPLE:

If variable is greater than 1, you would divide by the number in front of the variable to make it worth one whole.

$$2x - 4 = 10$$

$$2x - 4 + 4 = 10 + 4$$

$$\frac{2x}{2} = \frac{14}{2}$$

$$x = 7$$

$$\begin{array}{l} 2x - 4 = 10 \\ 2(7) - 4 = 10 \\ 14 - 4 = 10 \\ 10 = 10 \checkmark \end{array}$$

Things to Remember

Did you isolate the variable?

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SOLVING EQUATIONS:

EXAMPLE:

If variable is greater than 1, you would divide by the number in front of the variable to make it worth one whole.

$$3x - 3 = 4$$

$$3x - 3 + 3 = 4 + 3$$

$$\frac{3x}{3} = \frac{7}{3}$$

$$x = \frac{7}{3}$$

Things to Remember

✓ Did you isolate the variable?

✓ Did you have to divide by the number in front of the variable?

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SOLVING EQUATIONS:

EXAMPLE:

If variable is greater than 1, you would divide by the number in front of the variable to make it worth one whole.

$$5x - 17 = 3$$

$$5x - 17 + 17 = 3 + 17$$

$$\frac{5x}{5} = \frac{20}{5}$$

$$x = 4$$

Things to Remember

✓ Did you isolate the variable?

✓ Did you have to divide by the number in front of the variable?

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SOLVING EQUATIONS:

EXAMPLE:

If variable is greater than 1, you would divide by the number in front of the variable to make it worth one whole.

$$10y + 5 = 8$$

$$10y + 5 - 5 = 8 - 5$$

$$\frac{10y}{10} = \frac{3}{10}$$

$$y = \frac{3}{10}$$

Things to Remember

✓ Did you isolate the variable?

✓ Did you have to divide by the number in front of the variable?

Did you need to get rid of the fraction?

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SOLVING EQUATIONS:

EXAMPLE:

If variable is less than 1, you would multiply by the denominator, to make the variable worth one whole.

$$\frac{x}{4} = 3$$

$$4 \left[\frac{x}{4} \right] = 4(3)$$

$$x = 12$$

Things to Remember

✓ Did you isolate the variable?

Did you have to divide by the number in front of the variable?

✓ Did you need to get rid of the fraction?

Did you need to expand?

Did you have to collect like terms first?

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SOLVING EQUATIONS:

EXAMPLE:

If variable is less than 1, you would multiply by the denominator, to make the variable worth one whole.

$$\frac{x}{3} + 4 = 10$$

$$\frac{x}{3} - 4 = 10 - 4$$

$$\frac{x}{3} = 6$$

$$3 \left[\frac{x}{3} \right] = 3(6)$$

$$x = 18$$

$$\frac{x}{3} = 6$$

$$x = 18$$

Things to Remember

Did you isolate the variable?

Did you have to divide by the number in front of the variable?

Did you need to get rid of the fraction?

Did you need to expand?

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Connect

SOLVING EQUATIONS:

EXAMPLE:

If variable is less than 1, you would multiply by the denominator, to make the variable worth one whole.

$$\frac{x}{3} = \frac{1}{2}$$

$$6 \left[\frac{x}{3} \right] = 6 \left[\frac{1}{2} \right]$$

$$2x = 3$$

$$x = \frac{3}{2}$$

Things to Remember

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Practice

YOU TRY!

$$x + 16 = 20$$

$$x + 16 - 16 = 20 - 16$$

$$x = 4$$

$$3x - 14 = 23$$

$$3x - 14 + 14 = 23 + 14$$

$$3x = 37$$

$$\frac{3x}{3} = \frac{37}{3}$$

$$x = \frac{37}{3}$$

$$\frac{x}{4} + 5 = 21$$

$$\frac{x}{4} + 5 - 5 = 21 - 5$$

$$\frac{x}{4} = 16$$

$$4 \left[\frac{x}{4} \right] = 4(16)$$

$$x = 64$$

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Practice

CLASSWORK

Question 1 - 4 on the worksheet

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